Joseph Cohen

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Education

Massachusetts Institute of Technology (MIT) — Cambridge, MA
B.S. Mechanical Engineering (Concentration in Robotics) & Electrical Engineering — *2023 – 2028*
Activities: *MIT Hillel (Board President) | MIT Science Fiction Society (Librarian) | Pi Tau Sigma* — *GPA: 4.9/5*

Experience

Cosmic Frontier Labs — Oakland, CA
Engineering Intern — *May 2026 – Aug. 2026*

- Partnered with optomechanical engineers to redesign our telescope's primary mirror (M1) mounting flexures from blade to bipod, implementing liquid pinning to absorb assembly tolerances and minimize stresses in the mirror.
- Designed the M1 handling plate, produced manufacturing drawings for it and supporting hardware, and developed the concept of operations for handling and bonding the mirror.
- Built a reconfigurable testbench to qualify stepper motors and drivers ahead of their use in our focuser mechanism — TMC5262 driver bring-up and debug, browser-based control and telemetry, and four interchangeable load and metrology fixtures.
- Ran torque, stall-detection, and position-accuracy tests on motor and motor–leadscrew assemblies, characterizing sensorless stall detection across velocity regimes and measuring positioning to 1 μm to identify 10–15 μm of backlash and a 0.53% measurement-induced scale error.

SpaceRake — Cambridge, MA
Mechanical Engineering Intern — *Jun. 2025 – Aug. 2025*

- Solely designed and prototyped a patent-pending axially mounted gimbal system — 2–4 two-axis gimbals per tower on a shared axis — for pointing optical payloads in a networked configuration, producing the CAD and technical figures used in the IP filings.
- Implemented C++ firmware (Arduino/Teensy) with custom quaternion math libraries and a Madgwick orientation filter for 3D attitude estimation, plus a Python computer-vision tool that tracked visual beacons and fed error signals to a PID motor controller for active stabilization.

Mechanical Engineering Intern — *Jun. 2024 – Aug. 2024*

- Designed, 3D printed, and tested 100+ custom mechanical interfaces for optical payloads, iterating rapidly to meet tolerance and stability requirements.
- Built two vibration test rigs from scratch — electromechanical design, Python data acquisition on Raspberry Pi, accelerometer integration — and automated the test routines and analysis that guided interface redesigns.

MIT Solar Electric Vehicle Team (SEVT) — Cambridge, MA
Mechanical Engineer: Door Team Lead / Front Suspension — *Jan. 2024 – Aug. 2025*

- Led door subteam: modeled door, hinge, and latch in CAD with motion simulations to verify clearance and body integration, and ran design reviews on manufacturability.
- Designed front suspension geometry for a multi-occupant solar vehicle exceeding 75 mph; applied MATLAB for load and bearing calculations and FEA to reduce weight at a safety factor >1.3.

Projects

Project Pharos - Wirelessly Powered LED Lamp | *Resonant power electronics, analog control* — 2025

- Delivered ∼1 W across an air gap at up to 60% efficiency: custom-wound coils ($Q \approx 80$), a half-bridge inverter with PLL resonance tracking, and an RX-side DCM boost converter for impedance matching.

Project Orrery - Real-Time VGA Orbit Simulator | *PSoC, DMA video generation, embedded C* — 2026

- Generated 640×480 60 Hz VGA from a PSoC via DMA-streamed dual framebuffers with blanking-synchronized swaps; Keplerian orbit model with keypad, quadrature-encoder, and 14-digit SPI display I/O.

Proteus - Custom Mechanical Keyboard | *KiCad PCB, enclosure design, firmware* — 2024

- Custom key-matrix schematic and PCB in KiCad, a 3D-printed magnetic sandwich-mount case co-designed with the board, and matrix-scanning firmware.

Technical Skills

Mechanical: SolidWorks, Fusion 360, Onshape, Technical Drawing & GD&T, DFM, FEA, Controls
Electronics: KiCad (schematic & PCB layout), Power Converter Design, Embedded Design & Firmware, PCB bring-up
Manufacturing & Lab: 3D Printing, Sheet Metal, Laser Cutting, Waterjet, Manual Mill & Lathe, EE Lab Equipment
Software: Python, C, C++, Assembly, MATLAB & Simulink, PSoC Creator